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Computadoras de placa reducida Raspberry Pi 3 y Asus Tinker Board

Reduced plate computers Raspberry Pi 3 and Asus Tinker Board

Computadores de placas reduzidos Raspberry Pi 3 e Asus Tinker Board

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Resumen

El presente documento muestra la comparativa de dos computadoras de placa reducida, a saber, la Raspberry Pi y la Tinker Board. Estas placas han sido ampliamente utilizadas en la industria como microcomputadoras para desarrollar proyectos innovadores en el área de ingeniería, la mayoría de ellos relacionados con la electrónica, las bases de datos y las redes, entre otros; debido, principalmente, a que tienen la capacidad de trabajar datos generados a partir de sensores y posteriormente transmitirlos a otros dispositivos mediante el protocolo Zigbee. Además, estos datos, pueden ser incorporados en aplicaciones en la nube. Lo anterior tiene mucha aplicación en la solución de problemas de la vida cotidiana. La finalidad de esta comparativa es mostrar algunas de las ventajas de ambas tarjetas con miras a hacer más fácil la selección del dispositivo adecuado cuando se deseen implementar en proyectos de investigación innovadores.

Palabras clave: computadora de placa reducida, GPIO, Raspberry Pi, Tinker board, Zigbee.

Abstract

This paper presents a comparison between two reduced-motherboard computers, Raspberry Pi and Tinker Board. Both cards have been widely employed as microcomputers in the industry with the goal of developing innovative projects in engineering areas related to electronics, databases, networking, among others. In addition, they hold the capacity to process generated data obtained from sensors which can be transmitted to other devices afterwards via Zigbee protocol; this aforementioned capability has a variety of applications in the resolution of everyday life problems. The purpose of this comparison is to demonstrate the advantages of both cards, facilitating the selection of the most adequate device to implement in innovative research projects for technological areas; additionally, they can be deployed in cloud applications.

Keywords: single board computer, GPIO, Raspberry Pi, Tinker Board, Zigbee.

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Resumo

Este documento mostra a comparação de dois computadores de mesa reduzidos, ou seja, o Raspberry Pi e o Tinker Board. Estas placas têm sido amplamente utilizados na indústria de microcomputadores para desenvolver projetos inovadores no campo da engenharia, a maioria deles relacionados com eletrônicos, bancos de dados e redes, entre outros; principalmente devido a ter a capacidade de trabalhar os dados gerados a partir de outros dispositivos sensores e, em seguida, transmitir utilizando o protocolo ZigBee. Além disso, esses dados podem ser incorporados em aplicativos na nuvem. O exposto tem muita aplicação na solução de problemas da vida cotidiana. O objetivo desta comparação é mostrar algumas das vantagens de ambos os cartões, a fim de tornar mais fácil a seleção do dispositivo apropriado, quando você deseja implementar projectos de investigação inovadores.

Palavras-chave: placa de computador reduzida, GPIO, Raspberry Pi, Tinker board, Zigbee.

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Introduction

Currently information technologies (IT) are widely used in people's daily activities, as are electronic devices such as the Raspberry Bi 3 and the Tinker Board, which, despite their small size, have sufficient capabilities to compete in the market if its characteristics are taken into account, such as its memory, its processor and that include an Ethernet port, wifi and bluetooth. Additionally, because of their different types of sensors, they provide the opportunity to be implemented from a mobile application to hardware projects that require processing information in real time.

Both cards, the Raspberry Bi 3 and the Tinker Board, compete with each other in aspects such as processing speed, internal architecture, the number of peripherals, versatility, price and size; in addition, in the fact that both can support an operating system.

On the one hand, the Raspberry Pi 3 is a low-cost board that includes all the elements offered by a computer. Nowadays it has acquired great importance in the market due to its diversity of options for projects in computer networks, electronic circuits, robotics, home automation, security, programming, among other technological areas. Even some authors like Saari, Muzaffar and Hyrynsalmi (2017) have used the Raspberry Pi as a solution for the Internet of Things (IoT). In their research, these three authors mention that it is totally adaptable and that it can be used as a custom-made instrument, like a computer process, as well as making modifications for the operation of embedded systems, obtaining a better performance, high profitability and good data recovery. Also in the medical sciences, the Raspberry Pi has been used as a monitor of vital signs to detect heart failure, addressing anomalies in health through the technology of the global system for mobile communications (GSM) or via the Internet. , and can serve as a connection between patient and doctor (Pardeshi, Sagar, Murmurwar and Hage, 2017). In other applications, this device has been implemented in the area of biology, particularly in fish breeding, where it was implemented as a water quality monitor inside a tank. Through an Arduino microcontroller, in conjunction with the Raspberry Pi, it was possible to automate the feeding of fish in a timely manner, all through a web application (Hasim, Ramalingam, Ernawan and Puviarasi, 2017). Another advantage of this device is that it can function as a sensor node or router in telecommunications networks within the IoT (Gragasin, Talplacido and Macabale, 2017). Finally, in another work they implemented both the Raspberry Pi and the Arduino to perform the attendance record: they used it for the attendance record (ARD) and that function as a web server, while the transmission of the data was done with Zigbee technology (Sunehra y Goud, 2016).

On the other hand, its worthy opponent, the ASUS Tinker Board (ASUSTeK Computer Inc., 2017) is not far behind and promises to have a leading performance in its class. Some applications where this device has been implemented is in the multiplexing of two camera modules: Cooper, Azhar, Van Der Mark, Delmas and Gimel'farb (2017) proved that it can

be a good technological substitute for low speed GoPro systems. The Tinker Board has also been used in aspects more oriented to the internal architecture of custom memory by Altera OpenCL technologies to give applications of compilers where a kernel is used and it was demonstrated that one can obtain a data packet support from a card from Internet providers (Richmond, Blackstone, Hogains, Thai and Kastner, 2016).

As part of the contributions of this article, a brief comparison of the characteristics of both cards is presented, which will help to determine which is the most appropriate according to the case in which you want to implement a device of this type.

Next, the characteristics of the reduced size cards will be further specified.

Characteristics of small cards

Currently technologies are necessary almost for any activity of the human being. And for this reason it is essential to introduce to the technological world the community that is academically prepared to venture into applied engineering projects that solve problems or, where appropriate, improve and facilitate the daily life of people. Thus, cutting-edge technological tools are necessary to carry out projects that become truly transcendent and innovative.

Reduced plate cards

They are computers in a single board of reduced size with enough power to install and run operating systems in real time. In addition, it has a low price and they are multiplatform.

GPIO Ports

It is a general purpose input / output system (GPIO); a physical interface between the reduced plates and the outside world that has switches that allow to activate or deactivate the 40 pins, of which, the first 26 are GPIO, while the rest are electric and ground.

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Raspberry

The most current model is the B of Raspberry Pi 3, which has a storage unit with MicroSD Card Slot and is equipped with 35,000 packages and pre-compiled programs in a format that facilitates installation. In addition, despite being perfectly adapted to the board, it is not an operating system affiliated with the Raspberry Pi foundation, as it was created by a small team dedicated to developers, so it allows the installation of a large variety of operating systems, including Noobs, Ubuntu MATE and Windows, although the most commonly used is Rasbian based on Debian, with online support to update it. Additionally, it has a quad-core processor ARMv8 at 1.2 GHz of 64 bits of speed, enough characteristics to allow it to be implemented in applications as an access point; it can generate and process signals through different sensors through its GPIO ports or receive them through its Ethernet, wifi and bluetooth ports, and offers the possibility of connecting different devices through its USB port. Table 1 and Figure 1 show all these characteristics in detail (Raspberry Pi Foundation, 2017).

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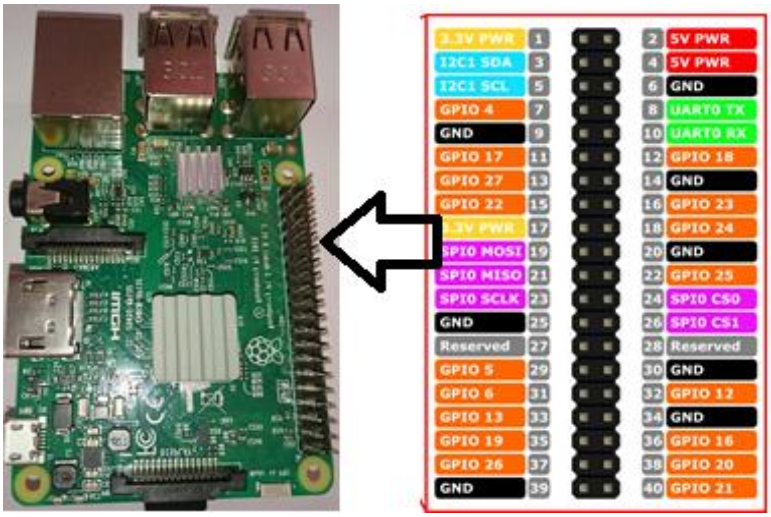
Tabla 1. Especificaciones técnicas de la Raspberry PI 3 B.

Especificaciones técnicas	Características
CPU	A 1.2 GHz 64 bits quad-core ARMv8 CPU
GPU	Video Core IV 3D graphics core
RAM	1 GB
Almacenamiento SD	Tarjeta Micro SD
Conectividad	4 puertos USB 2.0
Salida de video	Full HDMI
Salida de audio	Conector de audio de 3.5 mm Puerto HDMI
Red	802.11n Wireless LAN Bluetooth 4.1 Ethernet
Pines GPIO	40 pines GPIO
Consumo energético	350 mA (1.8 W)
Alimentación	5V (Micro USB o GPIO header)
Cámara	Se puede incluir una cámara

Fuente: Raspberry Pi Foundation (2017).

Figura 1. Tarjeta Raspberry Pi 3 y puertos GPIO.



Fuente: Raspberry Pi Foundation (2017).

Tinker Board ASUS

The ASUS company recently created the first version of its board, which is very similar to the Raspberry Pi 3, which has a 32-bit RK3288 Rock chip processor. Unlike the Raspberry, the Tinker Board at the moment only has two official operating systems, TinkerboardOS of Debian and TinkerOS Kodi. These and more features of the Tinker Board and its GPIO ports are shown in Table 2 and Figure 2, respectively.

Tabla 2. Especificaciones técnicas de la Tinker Board.

Especificaciones técnicas	Características
CPU	Rock chip RK3288 quad-core 1.8 GHz (32 bits)
GPU	ARM-based Mali T764 GPU
RAM	2 GB
Almacenamiento SD	MicroSD con soporte para velocidad de tarjeta UHS-I
Conectividad	4 puertos USB 2.0
Salida de video	HDMI
Salida de audio	Conector de audio de 3.5 mm 192 kHz / 24 bits Salida de audio y micrófono
Red	802.11 b/g/n Wi-Fi Bluetooth 4.0 + EDR 10/100 Ethernet
Pines GPIO	40 pines GPIO
Alimentación	Micro USB 5V/2A
Cámara	Se puede incluir una interfase para cámara

Fuente: ASUSTeK Computer Inc. (2017).

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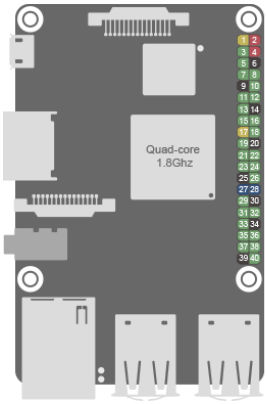
Figura 2. Puertos GPIO del Tinker Board.



1	VCC3.3V_IO	2	VCC5V_SYS
3	GP8A4_I2C1_SDA	4	VCC5V_SYS
5	GP8A5_I2C1_SCL	6	GND
7	GP0C1_CLKOUT	8	GP5B1_UART1TX
9	GND	10	GP5B0_UART1RX
11	GP5B4_SPI0CLK_UART4CTSN	12	GP6A0_PCM/I2S_CLK
13	GP5B6_SPI0_TXD_UART4TX	14	GND
15	GP5B7_SPI0_RXD_UART4RX	16	GP5B2_UART1CTSN
17	VCC33_IO	18	GP5B3_UART1RTSN
19	GP8B1_SPI2TXD	20	GND
21	GP8B0_SPI2RXD	22	GP5C3
23	GP8A6_SPI2CLK	24	GP8A7_SPI2CSN0
25	GND	26	GP8A3_SPI2CSN1
27	GP7C1_I2C4_SDA	28	GP7C2_I2C4_SCL
29	GP5B5_SPI0CSN0_UART4RTSN	30	GND
31	GP5C0_SPI0CSN1	32	GP7C7_UART2TX_PWM3
33	GP7C6_UART2RX_PWM2	34	GND
35	GP6A1_PCM/I2S_FS	36	GP7A7_UART3RX
37	GP7B0_UART3TX	38	GP6A3_PCM/I2S_SDI
39	GND	40	GP6A4_PCM/I2S_SDO

Fuente: ASUSTeK Computer Inc. (2017).

Conclusions

The reduced plate computers are used in a variety of projects with different operating system options, depending on the needs and applications to be used. In Table 1 and Table 2 it can be seen that the Raspberry and Tinker Board plates share many of their characteristics; but, in spite of it, they have remarkable differences: one is faster and another one has greater power. That is, the Tinker Board has more speed, but less processing capacity for its architecture of 32 bits, as opposed to the 64 bits of the Raspberry Pi 3. On the other hand, although the Tinker Board has two systems As a result of official operations and can support another, a distribution derived from Linux, the Raspberry currently supports a wide variety of operating systems. In addition, although most of the characteristics of the Tinker Board are superior to those of Raspberry Pi 3, it has two disadvantages: the first is the processing capacity and the second is the highest cost. Finally, in the comparison of projects that were carried out on different articles, it was observed that currently there are more applications of architecture, sensors and control of devices where they use analog or digital signals related to Raspberry Pi.

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